

Walk Forward Robustness and Performance Analysis

Walk Forward Robustness

To further reduce the effects of p-hacks (i.e. trying many different variations of WFO and cherry picking the one that works) and curve fitting, we have 3 methods.

1) Keep your variables adaptive

Try not to use arbitrary hard figures (eg. 30 pips stop loss) in your strategies. These figures do not adapt to the market. Use adaptive variables (eg. 2 ATR stop loss).

See more here: <https://algotrading101.com/blog/15000/fixed-trading-strategies-cant-adapt>

2) Multiple WFO

Instead of running 1 WFO, we run many slightly different WFOs and check if most of them produce good performances.

Good example:

We are running a bond mean reversion strategy on 3 bonds. Instead of running 1 WFO, we run 5 slightly different WFO.

- For 3 of them, we optimise the important parameters related to the entry and exit rules. We either choose different parameters or change the parameter steps or range.
- For 1, we change the entry and exit rules slightly (e.g. instead of firing 10 contracts at one shot, we fire 5 clips of 2 contracts at different prices).
- For the last, we optimise the stops and take profits.

If most of the 5 WFO work, we are more confident that our strategy is fundamentally valid.

If 1 of the WFO works very well and the others fall flat, there is most likely curve fitting or p-hacking issues.

Bad example:

Our strategy has 10 extern variables.

- We run 5 WFO while optimising 2 of them at a time.
- Or we run 1 WFO while optimising all 10 variables with small steps and huge ranges.
- Or we keep altering the strategy randomly (i.e. without a fundamental hypothesis) until we find a WFO that works.

3) Running multiple strategies

No one says you can only run one variation of your strategy live. You can run many similar versions of your strategy during live trading!

In the above example, after you have run 5 different WFOs successfully, run those 5 strategies concurrently while splitting your capital or sizing among them.

You can split your capital equally by 5 parts or focus more on the better performing ones.

We will talk more about capital allocation in a portfolio of strategies in PT101.

For now, just know that you generally don't want too much capital in the strategies that perform similarly (we want to diversify our risks), unless you are very confident of those strategies.

Others

Throwback to a previous lecture: [10 Ways to Minimise Curve Fitting](#)

WFO Performance Analysis

3 Points to note:

- Prudent Performance
- Performance Trends
- Walk Forward Efficiency

Prudent Performance

Don't just look for positive results. It should perform when it should and not when it shouldn't

- If your strategy strives during high volatility periods, it should not be profitable during times of low volatility.
- You don't want a trending strategy to work when you run it on a ranging period.
- If you are running a bond futures mean reversion strategy that strives during stable times without interest change, it should sustain losses during surprise rate changes.

If it does not work when it should, or works when it shouldn't. You should examine why that is so.

If it works all the time, that is a bonus!

Performance Trends

Another point is to look for patterns in your performance.

If your performance is dwindling over the years, it is a sign that the strategy is losing its effectiveness. If it is getting better over the years, or only performs well during certain months, you should examine why.

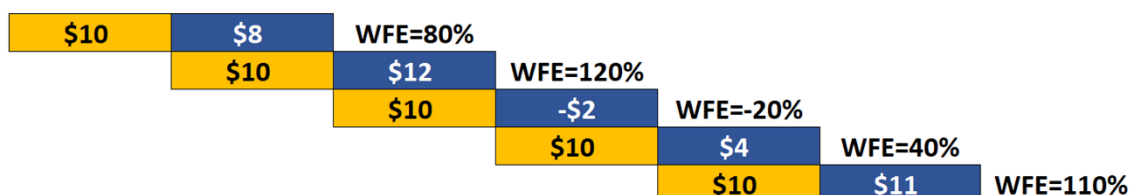
Walk Forward Efficiency

Walk forward Efficiency (WFE) = (Out-of-sample (OOS) performance / Number of OOS trading days) / (In-sample (IS) performance/ Number of IS trading days)

The numerator is the performance of the OOS period per day.

The denominator is the performance of the IS period per day.

This metrics tells us how the OOS period performed compared to its IS period.



2 Things to look out for:

WFE Performance

While we don't need our WFE to be 200% all the time, as a guide, a WFE of less than 50% is dubious.

WFE Consistency

Ideally, we want a WFE that is stable across the different periods. This is a sign that the IS period is consistently predicting the OOS period to some extent.

If the variance of the different WFE is high, this indicates that the prediction from the IS period is random, i.e. the IS period does not predict the OOS period.

Importance (or lackthereof) of your WFO

Yes, the WFO is the most important part of your testing process.

But don't take your WFO and backtests so seriously. The accuracy of your WFO is most likely going to be an issue because of data problems and other issues

(See: <https://algotrading101.com/wiki/backtesting-biases-and-risks/>).

Live performance is always going to be different from your backtests. You should use your backtests and WFO as a tool to understand your strategy and get a glimpse if your market hypothesis has any legs. We shouldn't try to create the perfect WFO performance, that usually leads to disaster.

When you find a strategy that is market prudent (i.e. works with good reason), it should feel obvious:

- You can see clearly why the strategy works
- You can see the opportunity while eye-balling without using any statistical analysis
- No matter how you change your parameters, your tests produce good results
- During times when it fails, you see a clear reason why that happens
- You can tell when the opportunity is fading off even before your strategy starts losing money